

# "DRY" OR "ARID" FARMING IN UTAH.

By Lewis A. Merrill, Professor of Agronomy, Agricultural College, and Editor of Deseret Farmer.

The Almighty did not give the Utah farmer easy problems. While their soil possesses extraordinary fertility, common experience taught the early pioneers that artificial means had to be taken to apply water before the soils would produce crops in rich abundance. And so irrigation was inaugurated for

to the cultivation of the soil, the selection of seed and method of planting.

## The First Experiments.

Dr. John A. Widtsoe is one of those enthusiastic, impracticable, trouble-some men who won't let "well enough" alone. He is one of those dreamers who insist on stirring things up and over-turning the order of "good old things."

million acres of desert land previously referred to receives an annual precipitation of at least 12 inches.

## Amount of Water Needed.

It has been demonstrated by a number of different investigators that to produce one pound of dry plant substance without irrigation requires about 750 pounds of water, and that to pro-

duce one bushel of wheat, approximately 50 tons of water are required. If ten bushels of wheat are grown per acre, according to these estimates, five hundred tons of water will be required. It is very difficult to realize that ten bushels of wheat requires in its production a million pounds of water, yet scientists assure us that this is really the case. It is a mystery no longer, however, when we make some calculations.

## The Method.

Select deep soil. The question as to the kind of soil is not so important as the depth of the soil. After clearing the land from sagebrush, plow the ground very deep, ten inches at least, and deeper if possible. If the land is to be cropped the same fall the plowed ground should be double disked, and then harrowed, this not only to prepare a good seed bed, but also to make a mulch or blanket through which the water can not evaporate. In selecting the seed, use some variety that has been grown on arid land, without irrigation, as long as possible. Any of the following varieties of wheat may be selected: Turkey, Lofthouse, Kofoid, Forty Fold, or Golden Coin, Odessa, Blue Stem, or many other varieties, which have been adapted to dry land farming. The seed should be treated before seeding, so that you may not reap what you sow. Soak the seed, which is held in a burlap sack for ten minutes, in a solution containing one pound of formalin in fifty gallons of water. After the seed is dry it is ready for use. Success is not likely to be achieved even now if the seed is broadcast instead of drilled. Use a small amount of seed, not more than three pecks to the acre and drill in as uniformly as possible. The shoe or wheel on the drill presses the soil around the delicate seed and at the same time leaves the ground loose and finely pulverized, a condition unfavorable to the evaporation of moisture. If a crust forms the next spring before the grain is three or four inches high, it is well to go over it with an iron harrow, slanting the teeth slightly backward. There is nothing left to do but to reap the harvest, and if all these details have been looked after carefully, you may feel confident of a good harvest.

Best results will be obtained if the land be followed every other year, and summer fallowing be practiced during the winter. In the early spring the surface soil should be removed in the fall. This is a matter of great importance. Many farmers who are already practicing "dry farming," fail to plow in the fall, but leave it until the next spring, when the soil contains more moisture. If you wish to use the precipitation which falls during the winter and spring, prepare the ground by deep plowing to retain this moisture. After plowing, leave the ground rough, unharrowed, during the winter. In the early spring the surface soil should be double disked and this should be done as early in the spring as the soil may be sufficiently dried, so that it will not stick to the disk. This disk, should be followed with a smoothing harrow, this early spring culture having for its purpose the loosening and drying of the surface, so as to prevent the evaporation of the moisture below. After each rainfall of any magnitude, the soil should be harrowed, as soon as the surface soil will not stick to the harrow. The disk and harrowing should be kept up during the summer in order to keep the weeds down and also to keep the loose soil mulched or blanketed through which the water cannot evaporate. The weeds must be kept down at all costs. A good crop of sunflowers uses as much water as wheat, and the beneficial effects to be expected from summer fallowing are entirely lost.

## History of Arid Farming in Utah.

There are men here and there throughout the State who have followed arid farming with indifferent success for many years. Haphazard methods have been in vogue and the industry has been confined to a very few counties in the northern part of the State. Dry farming has been practiced in Bear River City since 1865, and in Cache, Tooele and Davis counties, beautiful arid farms have been in existence for at least thirty years. There has been an unwarranted prejudice against arid farming in the central and southern sections of the State, even in those districts where the soil conditions and rainfall are much more favorable for arid farming than the districts referred to as having been successful. This prejudice led Dr. Widtsoe to recommend two years ago to Gov. Wells that the State establish four or five small experimental farms in different parts of the State, on which the feasibility of growing crops without irrigation could be tested, when correct cultural methods could be developed and where special

the work. The Legislature gave the bill unanimous support, and it met the approval of all classes of citizens. The direction of the farms was placed under the Utah Experiment station officers, who have carried on the work to the best of their ability.

## Location of the Farms.

A committee on location was appointed by the trustees of the Agricultural college, consisting of Trustee George C. Whitmore, Director John A. Widtsoe and the writer. This committee examined a great many districts, thought to be suitable for arid farming, and the board of trustees, acting upon the report of the committee, located six farms, as follows:

1. Iron county, four miles west of Parowan.
2. Juab county, six miles south of Nephi.
3. Sevier county, in Grass Valley, about eighteen miles southeast of Richfield, near Burrville.
4. San Juan county, six miles south of Monticello, near Verdure.
5. Tooele county, fourteen miles south of Grantsville and ten miles west of Tooele.
6. Washington county, at Enterprise, eighteen miles southeast of Modena.

Excellent cedar posts were used and set only eight feet apart. The fences are models of neatness. Each farm consists of but forty acres, but these forty acres are divided into a hundred or more plots, each of which is numbered, and an accurate record of each plot is kept in the home office.

## Work Already Accomplished.

The first crops were planted during

Utah farmer is the work of years of careful experimentation and exploitation. There is no doubt that as the experiments progress, man will acquire greater power over nature, or rather, a keener insight into nature's methods, by means of which he can compel plants of every kind to grow on the desert. It is certain that some crops will be more profitable than others. Sugar beets, for instance, will probably never



Barley Grows Successfully Without Irrigation in Utah.

the first time on the Western continent by civilized people. Millions of dollars have been expended in constructing reservoirs and canals and the parched barren deserts have been converted into profitable and beautiful fields of agricultural wealth.

During the past several years the Utah experiment station has been

Dr. Widtsoe knows something about Utah soils and Utah climate. For years he has made a study of these very things, and has insisted that Providence had a purpose in creating these desert lands. On assuming the directorship of the experiment station five years ago, Dr. Widtsoe suggested to the writer that these deserts offered one of the most fruitful fields of investigation. The entire summer (1901) was spent by

duce one bushel of wheat, approximately 50 tons of water are required. If ten bushels of wheat are grown per acre, according to these estimates, five hundred tons of water will be required. It is very difficult to realize that ten bushels of wheat requires in its production a million pounds of water, yet scientists assure us that this is really the case. It is a mystery no longer, however, when we make some calculations.

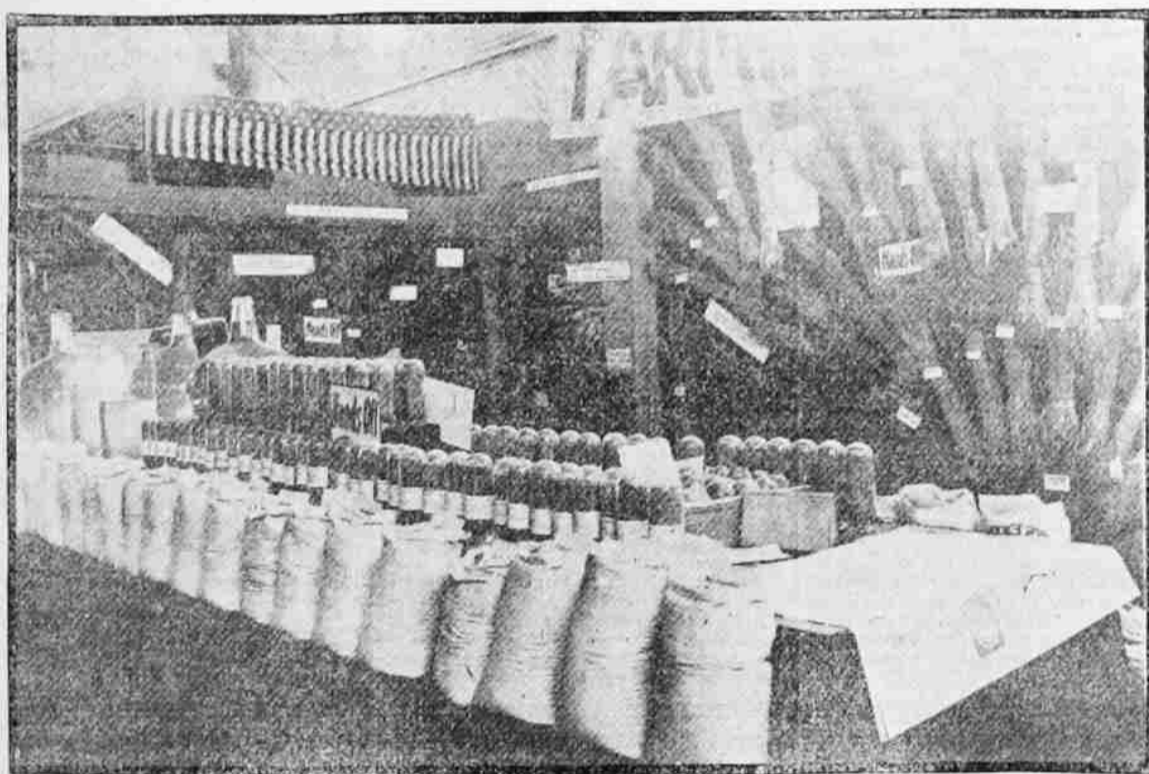


Exhibit of Arid Farm Products at Recent State Fairs.

working on the irrigation problem. As a result of their experiments, the workers at the station believe that with the present water supply the total area under irrigation and the entire crop output could be doubled, perhaps trebled. While the Utah people were pioneers in irrigation matters, they still have much to learn regarding the profitable use of water, and there is a great waste of water all over the State. The idea has prevailed that an increase in the amount of water applied would result in an increased crop. This has been shown to be a fallacy and that water applied beyond a certain amount did not result in increased yields, but did result in actual deterioration of the quality of the crop. The soils, too, are injured by the application of too much water. The soluble salts are dissolved and carried down in the soil to the surface water and later brought up to the surface and deposited as "alkali." The Government reclamation service has in view the construction of reservoirs and the building of canals by means of which thousands of acres more will be brought under irrigation. There is, then, with the work of the experiment station and of the national Government a possibility of increasing our irrigable lands by thousands of acres but even then there will still be thousands of acres of fertile lands and it is with the possibility of growing crops of these lands that this article deals.

## Area of Arid Lands.

Utah embraces an area of 82,130 square miles, of which there are 493 square miles under irrigation. It is probable that with the extension of the canals the storage of water in reservoirs and the more economical use of water, that this area can be doubled, perhaps trebled. Even with the most optimistic views regarding the increased area which can be brought under irrigation there will still be 60,000 to 70,000 square miles, of which probably one-half is mountain land, which can be used wisely for grazing. There remains, then, over 20,000,000 acres of desert land, soils which are among the most fertile in the world and it is these desert lands which constitute the great undeveloped resources of this State. There are a number of people in this State who believe that these deserts can be brought into successful cultivation. The method by which this is done is not a mystery, but simply the application of simple, scientific truths

and discover that our annual precipitation of 12 inches means 130 tons or over two and a half million pounds of water, or more than two and a half times as much as is necessary for ten bushels of wheat. If all of this water could be retained in the soil, we would have sufficient to produce twenty-seven bushels of wheat every year. Of course, much water is lost by evaporation when the crops are not growing, but where the

## Nature of the Deserts.

Chemical and physical analysis of the soil from these desert lands agree in showing that the elements of plant food are present in great abundance and that the texture and tilth of the soil is such as to warrant the belief that these soils possess wonderful agricultural possibilities. Where the rainfall is excessive much of the desirable plant food is dissolved and washed away—leached out of the soil. We do not have this condition with our desert lands and experience has shown that when the art of irrigation is applied to these lands they produce crops in great abundance. Too, the luxuriant growth of the native plants, sagebrush, greasewood, rabbit brush and sunflowers attest the wonderful natural fertility of the soils. The writer has traveled through some of Utah's great valleys many times, and often with difficulty found his way through rabbit brush and sagebrush much higher than an average man, and the belief has grown upon him that the conditions essential for such splendid growth of native plants, were also favorable to the production of profitable, cultivated crops. Does any reasonable mind suppose that a crop of wheat growing for a few months requires any more water than a thrifty crop of sagebrush or rabbit brush growing the entire year? There is no question regarding the great fertility of the deserts, and in considering locations for arid farms, securing a depth of soil sufficient to store the precipitation of one or two years is more important than the character of the soil.

## Studying Rainfall.

The rainfall of Utah was also carefully studied and it was found that it averages about 12 inches. It varies from 5 to 20 inches, but most of the twenty

field is allowed to lie fallow for one season and proper methods are adopted for the conservation of the moisture. It is reasonable to suppose that at least one-half of the precipitation can be retained for the use of the crop. If only ten bushels of wheat are secured, it is still a very profitable crop;

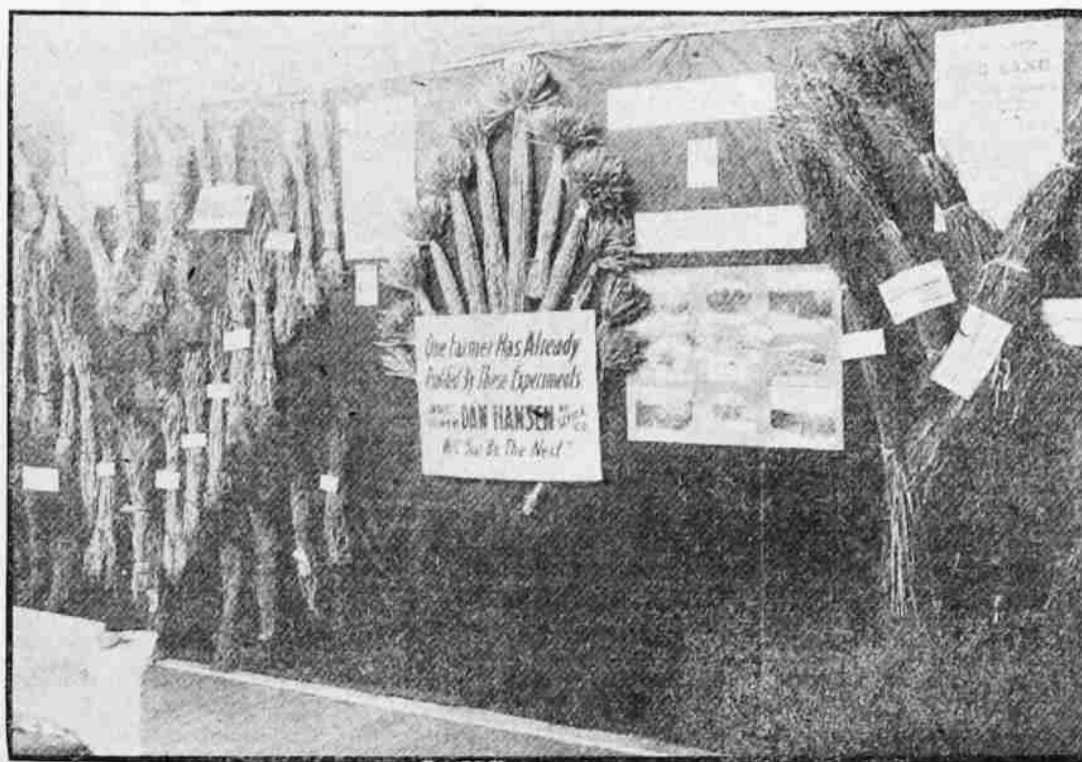


Exhibit of Arid Farm Products at Recent State Fairs.

brought resistant crops from other parts of the world could be introduced.

## Establishment of the Farms.

The last Legislature established five or more farms, with the above purpose in view, on the recommendation of Gov. Wells, and appropriated \$12,500 for

## Assistance of the Counties.

The land on which the farms were located was generously given to the State by the respective counties. In addition to this, each county cleared the ground from sagebrush and other native growth and fenced it with rabbit-tight

sets the unfavorable conditions, making the season about average. No arid farmer expects best results during the first season, realizing as he does that plowing and cultivating the soil increases its power to absorb and retain moisture. We were therefore surprised at the excellent yields secured. Wheat, oats, barley, rye, speltz and corn all yielded well, and convinced those who visited the farms that the successful production of these crops in Utah, does not depend upon the application of water. Wheat in some instances yielded over 25 bushels per acre, rye, 15 bushels, barley and oats 24 bushels, and corn 25 bushels. Lucerne planted in the spring of 1904 made an excellent stand and those in charge of the experiments are hopeful that lucerne and lucerne seed growing may be even more profitable than wheat. Potatoes, sugar beets, millet, dwarf Essex, rape and some other crops which were planted with the expectation of failure survived the season. In San Juan county, where the work was least successful, owing to the prolonged drought, sugar beets were grown weighing over two and a half pounds each, and this entirely with the spring rains.

An interesting observation made during this first year's work was that the crops grown without irrigation are much better in quality than those grown with irrigation. For instance, the value and quality of the wheat depends directly upon the amount of protein present. Wheat grown without water has been found to contain as high as 27 per cent of protein, as compared with 14 per cent in the irrigated wheat. The starch in potatoes, sugar in sugar beets, carbohydrates, fat and oil in corn are all influenced by the water applied and when grown without the application of water are much superior in quality. So marked is this influence that it has given rise to the hope that our arid deserts may eventually be great seed centers.

## Prospects for the Future.

Many of the plots on the various farms were left fallow during the past season and these have been absorbing and retaining moisture through the year, and so with an average precipitation next year, they should give much better yields than those already secured. The "idle dreams of the book farmers" have already been realized, but there is still much work to be done. To develop proper cultural methods, acclimatize new varieties and species, and convert the timid, doubting faith of the average

gave a yield of more than four tons per acre from one cutting and stored nearly four feet high and this on land which had not received irrigation for three years.

Who knows but that by proper methods broom grass may be made to grow on our mountain ranges? What about Kaffir corn, the crop that has saved Kansas during years of drought? There are new and special drought resisting varieties of alfalfa—what about them? Macaroni wheat, produced in years in a country of limited rainfall, without irrigation, succeeds admirably in western America. These wheat yielded more than 25 bushels per acre the first year after their introduction on the experimental State arid farms. May not these wheats be more profitable than our softer varieties. The various varieties of millet, too, have been found to withstand drought exceeding well in the Dakotas. May not millet be successfully grown here? These are questions which we shall expect the experimental arid farms to answer.

## Agriculture as a Science.

Those who are following agriculture as a profession should follow it along scientific lines and eliminate the elements of chance which has so largely dominated it as far as the farmer was concerned, by working unscientifically. Scientific methods rationally applied, will give us dominion over the desert. There are farmers in the State who have already proved by the experiment station and who, with a single year's crop have paid the entire expenses incurred in buying and clearing the land and seedling and harvesting the crop. Why should you hesitate?

## Possibilities of the Deserts.

Have you ever thought of what would mean to Utah if the young native sons of Utah, who have not claimed the deserts of Idaho, Wyoming and Canada, had put the same energy and effort into reclaiming the deserts of our own State? Twenty million acres, each one producing 20 bushels of wheat every year is a possibility dependent only upon the faith and enterprise of the young men of Utah. These are not the vapors of an over-dreamer, but actual conditions and facts that large crops can be produced from the desert. There is no reason why there should not be 20,000 more farms, 20,000 more prosperous farmers, 20,000 more new waste deserts.